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# COSMIC

## CONSORTIUM FOR SPACE MOBILITY AND ISAM CAPABILITIES

# ISAM DEMONSTRATION INFRASTRUCTURE TAXONOMY

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## REVISION AND HISTORY PAGE

| Revision No. | Description | Release Date |
|---|---|---|
| Rev A | Initial Baseline for Public Release | 02/25/2025 |
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# INTRODUCTION

The structure of the taxonomy is organized by types of infrastructure and will contribute to the schema for the Demonstration Infrastructure (DI) Database. This taxonomy will enable the DI community to have a common language for communicating on infrastructure needs and developments. Later revisions of this document will include definitions for each section and may expand the taxonomy to include additional items, as appropriate.

# DEMONSTRATION INFRASTRUCTURE TAXONOMY (DX)

## DX1: Physical Demonstration Infrastructure

### DX1.1 Terrestrial Demonstration Infrastructure

DX1.1.1 Environment Characterization

- DX1.1.1.1 Gravity Offloading Methods
- DX1.1.1.2 Vacuum
- DX1.1.1.3 Thermal
- DX1.1.1.4 Vibration
- DX1.1.1.5 Acoustic
- DX1.1.1.6 Shock Testing
- DX1.1.1.7 Radiation
- DX1.1.1.8 EMI/EMC Testing
- DX1.1.1.9 Atomic Oxygen
- DX1.1.1.10 Other

DX1.1.2 Rendezvous Proximity Operations and Docking (RPOD) Testing

- DX1.1.2.1 Docking Shock
- DX1.1.2.2 Robotic Capture/Dock/Mate Testing
- DX1.1.2.3 Proximity Operations Guidance, Navigation and Control (GNC) Hardware-in-the-Loop (HIL) Testing

DX1.1.3 Multi-DOF Systems

- DX1.1.3.1 Robotic Assembly Testing
- DX1.1.3.2 Robotic Servicing Testing

DX1.1.4 Loads and Structural Testing

DX1.1.5 Impact Testing

- DX1.1.5.1 Large Body Collision
- DX1.1.5.2 Micrometeoroid/Orbital Debris (MMOD) Impacts
- DX1.1.5.3 Other

DX1.1.6 Hot-fire Test Stands

DX1.1.7 Contamination Testing

- DX1.1.7.1 Dust
- DX1.1.7.2 Debris
- DX1.1.7.3 Off-gassing
- DX1.1.7.4 Other

DX1.1.8 Other (e.g., Mass Modeling, Illumination Extremes, Long-duration Exposure)

DX1.1.8.1 Camera, Lighting and Computer Vision Testing

### DX1.2 Airborne/Suborbital Demonstration Infrastructure

DX1.2.1 Crewed Systems

DX1.2.1.1 Aircraft
DX1.2.1.2 Crewed Balloon
DX1.2.1.3 Sub-orbital Rocket
DX1.2.1.4 Aircraft + Rocket

DX1.2.2 Uncrewed Systems

DX1.2.2.1 Balloon
DX1.2.2.2 Uncrewed Sub-orbital Rocket
DX1.2.2.3 High-altitude Aircraft
DX1.2.2.4 Drones

### DX1.3 In-space Demonstration Infrastructure

DX1.3.1 Crewed Systems

DX1.3.1.1 Launch (Up-mass)
DX1.3.1.2 On-orbit
DX1.3.1.3 Reentry (Down-mass)
DX1.3.1.4 Pressurized Persistent Platform
DX1.3.1.4.1 Microgravity Only
DX1.3.1.4.2 Artificial Gravity Only
DX1.3.1.4.3 Access to both Microgravity & Artificial Gravity

DX1.3.2 Uncrewed Systems

DX1.3.2.1 Launch (Up-mass)
DX1.3.2.2 On-orbit
DX1.3.2.3 Reentry (Down-mass)
DX1.3.2.4 Unpressurized Persistent Platform
DX1.3.2.5 Pressurized Persistent Platform
DX1.3.2.5.1 Microgravity Only
DX1.3.2.5.2 Artificial Gravity Only
DX1.3.2.5.3 Access to both Microgravity & Artificial Gravity

### DX1.4 Surface Demonstration Infrastructure (Lunar, Planetary, and Small Bodies)

DX1.4.1 Crewed Systems

DX1.4.2 Uncrewed Systems

## DX2: Digital Demonstration Infrastructure

*Note, the Digital Section is adapted from the 2024 NASA Technology Taxonomy and edited to fit the scope of this Demonstration Infrastructure Taxonomy)*

### DX2.1 Software Development, Engineering, and Verification and Validation (V&V)

DX2.1.1 Tools and Methodologies for Software Design and Development

DX2.1.2 V&V of Software Systems

DX2.1.3 Testing and Evaluation

DX2.1.4 Architecture and Design of Software Systems

DX2.1.5 Frameworks, Languages, Tools, and Standards

DX2.1.6 Software Analysis and Design Tools

### DX2.2 Modeling

DX2.2.1 Software Modeling and Model Checking

DX2.2.2 Integrated Hardware and Software Modeling

DX2.2.3 Human/System Performance Modeling

DX2.2.4 Near Real-time State Models

### DX2.3 Simulation

DX2.3.1 Distributed Simulation

DX2.3.2 Integrated System Life-cycle Simulation

DX2.3.3 Model-based Systems Engineering

DX2.3.4 Simulation-based Training and Decision Support Systems

DX2.3.5 Uncertainty Quantification and Nondeterministic Simulation Methods

DX2.3.6 Multiscale, Multiphysics, and Multi-fidelity Simulation

### DX2.4 Information Processing and Artificial Intelligence

DX2.4.1 Mission Data Life-cycle

DX2.4.2 Intelligent Data Understanding

DX2.4.3 Cyber Infrastructure

DX2.4.4 Edge Computing

### DX2.5 Mission Architecture, Systems Analysis, and Concept Development

DX2.5.1 Tools and Methodologies for Defining Mission Architectures and Design

DX2.5.2 Tools and Methodologies for Performing System Analysis

DX2.5.3 Tools and Methodologies for Vehicle and Concept Definition Activities

*For Other Testing Infrastructure, refer to TX13 from the 2024 NASA Technology Taxonomy, found here:* https://techport.nasa.gov/taxonomy